DOCUMENT RESUME

ED 284 236 CS 210 633

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TITLE Energy, Education, and Media Use: A Panel Study of the Knowledge Gap.
PUB DATE Aug 87
NOTE 37p.; Paper presented at the Annual Meeting of the Association for Education in Journalism and Mass Communication (70th, San Antonio, TX, August 1-4, 1987).
PUB TYPE Reports - Research/Technical (143) -- Speeches/Conference Papers (150)

EDRS PRICE MF01/PC02 Plus Postage.
DESCRIPTORS Educational Attainment; *Information Sources; *Knowledge Level; *Mass Media Effects; Media Research; Newspapers; Public Affairs Education; *Public Opinion; *Sociocultural Patterns; Television Viewing
IDENTIFIERS Energy Crisis; *Knowledge Gap Hypothesis; *Media Use

ABSTRACT

A follow-up panel study investigated whether a knowledge differential based on individual educational differences develops in a community, and additionally, whether media use is associated with differential gain in knowledge across education levels. It was hypothesized (1) that education would have a positive effect on public affairs energy knowledge and energy issue relationships, (2) that education would have a positive impact on public affairs media and energy media use, and on public affairs knowledge, and (3) that energy issue salience would be positively related to energy issue relationships and public affairs mass media use. Subjects, 650 randomly selected homeowners in a Wisconsin community, completed telephone interviews over a period of three years. Results indicated that education did have an impact on public affairs energy knowledge, but that energy media were used more evenly across higher and less educated subjects. Energy issue salience was positively related to energy issue relationships and public affairs mass media use. Findings suggested that information campaigns about energy and other complex issues need to take into account different patterns of media use and knowledge gain related to social status, particularly education. Energy communication media seem to be used equally by the more or less educated, although knowledge about energy is most consistently related to reading of newspaper energy stories by the more educated, and to viewing televised energy commercials among the less educated. (Tables of data and a list of references are appended.) (NKA)

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ENERGY, EDUCATION, AND MEDIA USE: A PANEL STUDY OF THE KNOWLEDGE GAP

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Presented to: Communication Theory and Methodology Division, Association for Education in Journalism and Mass Communication, annual convention, San Antonio, Texas, August 1987.

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Abstract

ENERGY, EDUCATION, AND MEDIA USE:

A PANEL STUDY OF THE KNOWLEDGE GAP

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A three-year panel study found education related to knowledge gain, and to some maintenance of a knowledge differential, in regard to the energy issue. Use of various public affairs media was stronger among the more highly educated, although use of energy communication media was about equal across education groups. Reading of newspaper energy stories bore the most consistent relationships with energy knowledge among the more highly educated, and viewing of energy commercials bore the most consistent relationships with energy knowledge among the less educated.

Communication Theory and Methodology Division
Association for Education in Journalism and Mass Communication
Annual Convention, San Antonio, Texas, August 1987

ENERGY, EDUCATION, AND MEDIA USE:

A PANEL STUDY OF THE KNOWLEDGE GAP

In the fourteen years since the first "energy crisis," a multitude of studies have been conducted into the political, economic, social, and consumer impact of this era of uncertain energy supplies. More than a hundred public opinion polls dealing with energy were conducted in the 1970s alone (Farhar et al., 1979). Yet, very little data exist regarding the public's knowledge of energy (Farhar-Pilgrim and Shoemaker, 1981). There is relatively little research providing reliable evidence on relationships between media use and energy knowledge, despite the large number of public information campaigns about energy conducted by various government agencies, utilities, and other groups (McLeod et al., 1987), and despite evidence that the public tends to name the mass media as their major source of energy information (Farhar-Pilgrim and Shoemaker, 1981).

More is known about the salience ascribed the energy problem by the public, although mostly at the level of the aggregate data provided by major polling organizations. After an extensive review, Farhar et al. (1979) observed that most Americans in the 1970s viewed the energy situation not as a "crisis", but as a moderately serious problem that would be chronic for the foreseeable future. This view of the energy problem is shared by many energy experts (e.g., Stobaugh and Yergin, 1979; Hughes et al., 1985), who caution against ignoring the long-term nature of the energy problem in the face of the periodic appearances of energy gluts. Nonetheless, the salience of the energy problem, which was consistently named as one of the most important problems facing the country in the 1970s, dropped markedly after early 1981 (McLeod et al., 1987). Although no research to date relates media coverage of energy to

perceived energy issue salience, there is some evidence that exposure to some public affairs and energy media content correlates consistently with the salience individuals ascribe to the energy issue (McLeod et al., 1987; Griffin 1987).

Winnett and Ester (1983) have noted that dissatisfaction with proposed economic solutions to energy problems has prompted calls for more input of behavioral science perspectives--including communication research--into the development of energy policy. Fahar-Pilgrim and Shoemaker (1981) note in particular that a closer link to empirical theory in communication is required if government programs designed to influence public awareness of energy facts are to be successful. Olien et al. (1983) observe that information programs on any topic that attempt to overcome knowledge disparities "must be organized in such a fashion as to counter the existing structural factors that lead to differential accrual of knowledge." Thus, it seems worthwhile to examine further the relationships between energy awareness, energy knowledge, and patterns of media use in different segments of society.

Education and Knowledge

In their "Knowledge Gap" model, Tichenor et al. (1970) have proposed that as mass media infusion of information into a social system increases, higher status (better educated) segments acquire this information at a faster rate than lower status segments (less educated). Education, they propose, influences the rate of knowledge gain since it is associated with better information-processing, comprehension, retention, and communication capabilities, higher levels of previously stored knowledge, and increased numbers of relevant social contacts. Higher status segments also tend to show more dependence on newspapers, which are oriented toward this group.

Based on her review of Knowledge Gap research, Gaziano (1983) notes that a consistent relationship tends to exist between education and greater knowledge of various topics. Time-trend studies, as compared to cross-sectional, tend however to show unchanging or narrowing gaps, even when publicity is high. Thus, other factors may be operative. Conflict can close knowledge gaps when the public is involved in the conflict (Olien et al., 1983), although one study has found that interest group activity in neighborhoods can stimulate the flow of information through a neighborhood, with a resulting education-based knowledge gap (Gaziano, 1984). Ceiling effects in knowledge or its measurement can also produce an indication of closing gaps (Ettema and Kline, 1977).

The motivation to acquire information has been examined as another factor related to knowledge differentials. Donohue et al. (1975) noted that knowledge gaps can be reduced if various segments of society are equally motivated to get the information. Genova and Greenberg (1979) found that interest in news--in particular "social interest" or the extent to which information is perceived as functional in interpersonal networks--was more closely related than education to structural knowledge of an event (relationships manifested in an event, such as cause-effect and its relationship to other events). Education and interest were equivalent predictors of factual knowledge (e.g., names and dates). They note that "self-interest"--information perceived as functional for day to day living--while it did not prove to be a predictor in their study may nonetheless prove relevant in analysis of knowledge of news events more closely related to personal perceptions of well-being. In a study of an information campaign related to cardiovascular health, Ettema et al. (1983) found that motivation to acquire information in this domain was a major factor in knowledge accrual. The campaign eliminated an existing knowledge gap between the higher and the less educated.[1]

Salience and Knowledge

It has been proposed that mass media can influence the perceived salience of an issue through the "agenda-setting" process (Shaw and McCombs, 1977), a proposition which has mixed although relatively positive support in various studies (Weaver, 1984).

Processing or recall of information relevant to salient issues might be expected to increase the network of relationships individuals hold in memory regarding these issues. Knowledge structures, or schemata, are based in part on the network of interrelations the individual believes to exist among the constituents of the concept in question (Rumelhart and Ortony, 1977). As Weaver (1984) observes, "no issue is made salient, discussed, or acted upon in isolation from other issues and previous happenings. It is not simply a matter of proceeding from increased salience to the formation of an opinion about each issue in an orderly manner; rather the increased salience of an issue...is likely to invoke a mixture of cognitions and feeling linked to that issue...." Thus, salience could influence the cognitive structure of relationships held in memory regarding that issue.

Communication and Energy Knowledge

Studies that have related education to knowledge of the energy issue have found that the more educated are more knowledgeable and are aware of more sources of energy information. The more educated also ascribe more salience to the energy situation (Farhar et al., 1979).

A study of the effects of a yearlong series of newspaper articles on energy found that knowledge of energy increased among subscribers and that education was related to higher levels of energy knowledge before and after (Abbott, 1978). In a 1981 study of two communities, McLeod et al. (1983) found that measures of knowledge of the energy problem correlated positively with social status in one community but not the other. They also found that salience did not relate to knowledge in either community, although knowledge related to attitudes in one community (the former) and salience related to attitudes in the other (the latter).

This study, a follow-up based on three successive years of data from the second community, investigates whether a knowledge differential develops in that community based on educational differences. It further investigates whether media use is associated with differential gain in knowledge across educational levels. The previous two-community study found no consistent pattern at that one point in time, although it is conceivable that patterns could emerge.[2]

The analysis will also look for patterns indicative of motivational differences. Social interest may be indicated in patterns of interpersonal discussion about public issues and about energy use. Self-interest in energy may be relatively high as compared to other public issues, since the energy problem affects the cost of living, personal comfort, and even health. It might be expected that those of lower income, the elderly, persons living in older homes, and those who have larger families might be more affected by the energy problem. If these variables motivate information gain, then energy knowledge should be more strongly correlated with income (negatively), age, age of the house, and number of inhabitants (all positively) than with education. Similarly, the less well-off, the elderly, those living in older homes, and those with larger families may see the energy problem as more salient.

The evidence that does exist from past studies does not support these propositions, however. Income correlates positively both with knowledge of the energy situation and with the perceived salience of the problem (Farhar et al., 1979). Age was found to be unrelated to energy issue salience and knowledge (Farhar et al., 1979), although Abbott (1978) found that younger readers learned more than the older from a yearlong newspaper series on energy.[3] The relationship of size of the family and age of the house to energy issue salience or knowledge have not been examined. This analysis will be alert to the relationships of these variables to energy issue salience and knowledge. It will also look for relationships among energy issue salience, knowledge, and attitudes.

Hypotheses

Knowledge regarding the energy situation will be assessed by two related measures: a closed-ended test (Public Affairs Energy Knowledge) and an open-ended question that taps the number of relationships individuals draw between the energy issue and other concerns (Energy Issue Relationships). Based on the Knowledge Gap model:

> H1: There will be a positive relationship between education and Public Affairs Energy Knowledge.
>
> H2: There will be a positive relationship between education and Energy Issue Relationships.

Since information-processing, comprehension, retention, and communication capabilities are expected to be better developed among the more highly educated, they should accrue more knowledge than the less educated through use of public affairs and energy media. Therefore:

> H3: The relationship between public affairs and energy media use and Public Affairs Energy Knowledge will be stronger among the more educated than among the less educated.

H4: The relationship between public affairs and energy media use and Energy Issue Relationships will be stronger among the more educated than among the less educated.

If perceived salience of an issue stimulates cognitive processing of relationships between that issue and other happenings:

H5: There will be a positive relationship between Energy Issue Salience and Energy Issue Relationships.

Provided that public affairs and energy mass media contain some energy content:

H6: There will be a positive relationship between public affairs mass media and energy mass media use and Energy Issue Salience.

RESEARCH DESIGN

West Allis, Wis., a community of 64,000 population in the Milwaukee metropolitan area, was chosen as the research site. At the time of this study, the community had undergone difficult winters in 1980-81 and 1981-82. The nation was still overcoming the 1979 Mideast oil shock. Thus, there may be considerable personal interest in the energy situation in particular among those who would be feeling the energy cost "pinch."

In 1981, the community had participated in city-wide infrared diagnoses of heat loss from homes. The infrared analyses received considerable publicity. Local utilities were promoting energy conservation, relating it to the national energy problem, through television commercials and other advertising. The Department of Energy's programs in communication, using paid advertising, had attempted since the late 1970s to increase public awareness and knowledge of energy issues as part of consumer response to the overall energy problem (Hutton, 1982). The metropolitan dailies had created a

specialized news reporting beat. In this community, some conflict appears to have been generated in 1980 by a woman who vocally protested that her energy conservation measures had not saved her any money. She circulated a petition, and received media coverage.

A relatively large contingent of blue-collar workers provides some important variance in social status in this suburban community. Owners of single-family homes were the population of interest since their energy behavior options are relatively unconstrained as compared to residents of other types of dwellings--apartment renters, for example. Heads of households were chosen because of their decision-making roles in the home.[4]

A panel of 351 single-family homeowners in West Allis completed telephone interviews beginning in the fall of 1981.[5] The homeowners were chosen by taking a systematic probability sample of owner-occupied residences listed in the city directory, augmented by random-digit dialing in proportion to West Allis telephone exchanges. Respondents were further screened to ensure they lived in West Allis, in single-family homes, owned the homes, and were the male or female heads of the households.

In the fall of 1982, 227 (or 65%) of the original panel members were successfully reinterviewed.[6] An additional set of 181 single-family homeowners, chosen in the same manner as was the original sample, were added as a control for sensitization, bringing the total of interviews conducted in 1982 to 408. In the fall of 1983, 307 (or 75%) of the 1982 respondents were again interviewed. An additional sample of 118 single family homeowners, chosen in the same manner as the others, were added to control for sensitization. In all, 425 respondents took part in the 1983 wave of interviews. All 1982 and 1983 interviewees were screened as in 1981 to ensure that they qualified as respondents. A total of 171 (49%) of the 351 respondents in the 1981 wave remained in the study for all three years. In all, 650 respondents were

involved in the study. None of the respondents had been told that they would be reinterviewed.

Interviewers in 1981 and 1982 were graduate students and advanced undergraduates trained as members of communication research courses. In 1983, interviewers included graduate students, undergraduates, and members of the community, all of whom received interviewer training.[7] Interviews were conducted in October and November of each year, and were validated by random callbacks. On the average, each interview took about 15 to 20 minutes.

Measurement

Demographic/Control Variables:

The respondent's educational level, age, income, the age of the dwelling unit, and the number of inhabitants (hereafter referred to as "family size") were measured in all three years of the study. These five variables have been found in other studies and analyses to influence energy conservation behavior, attitudes, saliences, or knowledge either directly or indirectly (see Ritchie et al., 1981; McLeod et al., 1983; Griffin, 1987). As a measure of sensitization, respondents were coded in 1982 and in 1983 according to the number of previous years they had been in the study.

Education was measured as the number of years of formal schooling completed. A dichotomous measure of education was constructed in each year by breaking the sample into those whose education was beyond high school (the "more educated") and those whose educational attainment was high school or less (the "less educated"). While this provides approximately a split of one-third "more educated" to two thirds "less educated" in this community, it is as close to an even split as possible, and is a meaningful split.

Energy Issue Knowledge:

Public Affairs Energy Knowledge was measured by a closed-ended test in the questionnaire that included items concerning knowledge of the energy situation and about energy processes and relationships.[8] (Correct answers are indicated in parentheses after each item.) The 1981 Public Affairs Energy Knowledge items (see McLeod et al., 1983) were:

> What nation produces the most oil annually? The U.S., Saudi Arabia, Iran, or the Soviet Union? (Soviet Union.)
>
> By 1990, the average cost of fuel in Wisconsin is expected to remain the same, increase by 50%, double, or triple? (Triple.)
>
> How much of Wisconsin's electric energy comes from nuclear power? Less than 1%, about 10%, about 35%, or about 75%? (About 35%.)
>
> Would the deregulation of natural gas raise natural gas prices, lower them, or have no effect on them? (Raise.)
>
> True or false? At current rates, within 20 years so much of the nation's natural gas will be used up that there won't be enough to heat the homes now using gas. (False.)

After 1981, the first and second questions were dropped and the following items were added:

> Since 1979, has the per capita consumption of energy in the United States increased, decreased, or remained the same? (Decreased.)
>
> Which mode of transportation uses the largest share of energy used for transportation? Overall, would you say: railroads, airlines, freight-hauling trucks, or private autos? (Private autos.)
>
> Overall, which fuel provides the largest share of the energy we use in the United States? Would you say coal, natural gas, oil, or nuclear power? (Oil.)
>
> True or false? The earth constantly replaces the reserves of oil, coal, and natural gas as we use them? (False.)

Energy Issue Relationships were assessed in 1982 and in 1983 by the following open-ended question:

> Some people say that some issues are related to other issues. For example, some people say that the crime problem might be related to law enforcement, poverty, and other concerns. What about the energy problem? What other issues, if any, come to your mind as related to the energy problem?

The number of issues named in response to the question became the Energy Issue Relationships score. Energy Issue Relationships correlate r.18 ($p<.001$) with Public Affairs Energy Knowledge in 1982, and r.28 ($p<.001$) in 1983.

Salience and Attitudes:

Energy Issue Salience was measured according to the importance ascribed energy as an issue by the respondent.[9] Energy Conservation Attitudes were measured by summing, and dividing by five, the ratings on five-point Likert scales for five items. [10]

Communication Variables:

Media Exposure. Newspaper exposure is the sum of standardized scores measuring the number of days a week the respondent reads a newspaper and the average amount of time spent when reading a newspaper. Television exposure, similarly, is the sum of standardized scores measuring the number of evenings a week the respondent watches television and the average number of hours spent when watching after 5 p.m. Use of weekly newspapers was measured by asking respondents the number of weekly or biweekly newspapers they read regularly.

Public Affairs Media Use. Newspaper public affairs usage was measured by the sum of standardized scores measuring the frequency that respondents read stories about local and state government and politics, stories about national government and politics, and read editorials. Television public affairs usage was measured by the sum of standardized scores measuring the frequency of viewing national news programs, local and state news shows, and news specials and documentaries. Public affairs magazine reading was also measured by asking respondents what news magazines, if any, they read regularly, and counting the number they named.

In addition to these public affairs mass media usage questions, respondents were asked how much they rely on family and friends for information about current events.

Energy Media Use. Processing of newspaper energy information was measured as the sum of standardized scores of questions determining the likelihood the respondent would read a newspaper article on energy if he or she came across it, and the likelihood that the respondent would "stop and think about ideas in the article" after reading. Processing of television energy information was assessed by summing the standardized scores of questions determining the likelihood the respondent would watch a program about energy, and the likelihood the respondent would "stop and think about the ideas in that program" after viewing.[11] Exposure to energy commercials was measured by a question asking respondents whether they had seen any commercials recently about energy conservation practices. Exposure to utility pamphlets was measured by a question about the frequency that the respondent reads the brochures and pamphlets that come as utility bill inserts.

In addition to these energy mass media variables, interpersonal communication about energy was measured by asking respondents how frequently they discuss energy use in the home with persons who are not a part of the household.

Statistical Analysis

Missing data in age, age of house, and family size were replaced with the sample means in all three years. Missing data in income were replaced wherever possible by referring to the respondent's answer to a question assessing social class (not otherwise used in the analysis), and using the sample mean income for a given level of social class. Otherwise, the sample mean was used.

Partial correlations were used to examine relationships between educational level and other control variables, the communication variables, energy issue salience, conservation attitudes, and, initially, the energy knowledge variables in each year. Control variables in the partial correlations are the other demographic variables, along with sensitization in 1982 and 1983.

Hierarchical multiple regression analyses, with listwise deletion of missing data, were used to test relationships with the energy knowledge dependent variables. Cross-sectional (within-years) analyses were conducted by entering, in successive blocks: education; income, family size, age; age of house; conservation attitudes and issue salience; media exposure variables; public affairs media variables; then energy media variables. Sensitization was entered as a separate block prior to education in 1982 and 1983 within-years analyses.

Relationships of independent variables with change in the dependent variable since the previous year (1981-82, 1982-83) in the panel were assessed by entering the previous year's measure of the dependent variable as the first block, instead of sensitization (e.g., 1981 Public Affairs Energy Knowledge entered first, with 1982 Public Affairs Energy Knowledge dependent). Then the other variables, measured in the same year as the dependent variable, were entered in the order noted above. Although time is involved, the partial betas represent correspondence and not causality (see Cohen and Cohen, 1975). Autocorrelations of demographic, attitude, and media variables are relatively high over time. Thus, this analysis proceeds to use them as levels, rather than relating their changes over time to changes in the dependent variables over time. The dichotomous education measure was used in the analysis only to separate subsamples for analysis of H3 and H4.

The same approach was used in analyses using Energy Issue Salience as the dependent variable, except that Public Affairs Energy Knowledge was entered as an independent variable in its place.

Inferences from the regression analyses will be based on cross-checking evidence of change in the panel over time with coefficients generated cross-sectionally, where sensitization is controlled. In regard to energy knowledge, analysis will also take into account convergence of findings across the two measures.

RESULTS

The partial correlation of education with control, independent and dependent variables for each of the three years of the study is shown in Table 1. The partial correlations between education and sensitization (number of years in the study up to that point) are near zero and non-significant. Thus, it

does not appear that education has any relationship with the extent of respondent participation in the study over time.

As would be expected, education correlates positively with income in all three years. Less educated persons tend to be older and living in older, presumably less energy-efficient homes. This syndrome could magnify any knowledge-gap effects among those of lesser economic means who live in energy-inefficient homes, unless they are motivated to gain knowledge because of self-interest.

The most consistent relationships of media use with education are in the use of public affairs media, in particular public affairs magazines. The more educated are more likely to read these magazines across all three years. In two of the three years (1981 and again in 1983), the more educated spent more time with newspapers and were more likely to attend to newspaper and television public affairs content. They were also more likely to read weekly newspapers in one year, and spend less time with television in another.[12] Education shows little relationship with use of energy media, although the two relationships that do exist (with energy discussions in 1981 and with commercials in 1983) are both in the direction of greater use by the more educated. Overall, these patterns are consistent with the Knowledge Gap hypothesis, and could amplify differences in information gain between the more educated and less educated.

Pro-conservation energy attitudes correlate consistently with education across all three years of the study, but the relationship is weak. Past research has found it difficult to find relationships between education and energy conservation attitudes (see Farhar et al., 1979), even though environmental concern has been found to correlate positively with educational level in other studies (see Weigel, 1977). Energy issue salience bears a weak relationship with education, but only for one year (1981).

Education and Knowledge Gain

Based on the Knowledge Gap model, it has been proposed that:

H1: There will be a positive relationship between education and Public Affairs Energy Knowledge.

H2: There will be a positive relationship between education and Energy Issue Relationships.

The relationship of education with both knowledge measures is consistent with the Knowledge Gap model.[13] Education does not correlate significantly with the Public Affairs Energy Knowledge test in 1981, but does in 1982 and in 1983. Education also correlates positively, and at about the same magnitude of strength, with the number of Energy Issue Relationships named in 1982 and in 1983. Further analysis will attempt to determine whether gain in these forms of knowledge across years is based on amount of education.

Table 2 indicates that gain in Public Affairs Energy Knowledge is positively associated with educational level from 1981 to 1982 (partial beta .29, $p<.001$). The relationship between education and this form of knowledge weakens from 1982 (partial beta .17, $p<.001$) to 1983 (partial beta .09, $p<.05$), while remaining statistically significant. The relationship of education to gain in Public Affairs Energy Knowledge 1982-83 weakens (partial beta .06) and is not statistically significant. H1 is supported in terms of greater information gain by the more highly educated from 1981 to 1982, and in terms of some maintenance of the difference in 1983. It is possible the gap began to close in 1983, although slightly.

Education is associated positively with gain in Energy Issue Relationships 1982-1983 (Table 3) in the longitudinal panel. Cross-sectionally within each year, however, the relationship between education and this dependent measure remains about constant, if not slightly diminished across time. Thus, caution requires that H2 not be supported in terms of gain across time, even though the more educated do generate more Energy Issue Relationships than the

less educated in both years. Had this variable been measured in 1981, perhaps gain would have been detected (as it was with Public Affairs Energy Knowledge).[14]

There is no relationship between family size and either knowledge measure. Income is not consistently related to knowledge, and the one relationship that does exist (in 1982 with Public Affairs Energy Knowledge) is positive. Age bears a consistently negative relationship with knowledge (except with Energy Issue Relationships in one year). Age of the house is unrelated to knowledge, except for one year. None of these relationships is in the direction that would be expected if economic, health, and quality of life concerns were motivating greater self-interest information gain among those who are older, living in older homes, less well-off, of who have more people in the household. In regard to social interest, the interpersonal communication variables have no relationship to measures of energy knowledge in any year.

Media Use and Energy Knowledge

Media use bears relatively few significant relationships with the measures of energy knowledge (Tables 2 and 3). Most of these relationships are with use of newspapers and viewing of televised energy commercials. All of the significant coefficients but one--the relationship between reading weekly newspapers and Public Affairs Energy Knowledge in 1983 [15]--are positive. From 1982 to 1983, time spent reading newspapers is associated with gain in Public Affairs Energy Knowledge, and reading of newspaper public affairs content is associated with gain in Energy Issue Relationships. Reading of newspaper energy stories correlates with higher levels of Public Affairs Energy Knowledge in 1982 and 1983. Energy commercial viewing correlates with higher levels of Public Affairs Energy Knowledge in 1981 and

in 1983, and with gain from 1982 to 1983. Commercials are also associated with higher levels of Energy Issue Relationships in 1982. There appears to be a weak relationship between viewing of television energy stories and gain in Issue Relationships 1982-83.

In regard to the influence of education on knowledge gain from media use, it has been proposed:

> H3: The relationship between public affairs and energy media use and Public Affairs Energy Knowledge will be stronger among the more educated than among the less educated.
>
> H4: The relationship between public affairs and energy media use and Energy Issue Relationships will be stronger among the more educated than among the less educated.

There are relatively few statistically significant relationships between the media use variables (public affairs and energy media) and the dependent variables of Public Affairs Energy Knowledge (Table 4) and Energy Issue Relationships (Table 5). The significant relationships do not appear either stronger or more plentiful among the more educated than among the less educated for either dependent variable. Thus, there is no evidence to support H3 or H4.

Nonetheless, there are some noteworthy patterns across time or across measures. Contrary to expectations, among the less educated gain in Energy Issue Relationships is associated with reading public affairs newspaper content 1982-1983, and newspaper exposure with gain in Public Affairs Energy Knowledge in the same years. Reading of newspaper energy stories is associated with higher levels of both dependent measures for the less educated in 1982.

The most interesting and consistent patterns, however, are found in regard to reading of newspaper energy stories by the more educated and viewing of televised energy commercials by the less educated. Reading newspaper energy stories leads to gain in both Public Affairs Energy Knowledge (Table 4) and Energy Issue Relationships (Table 5) from 1982 to 1983 among the more educated. Viewing of energy commercials plays about the same role in those years, across both knowledge measures, for the less educated. (The relationship of commercial viewing to gain in Energy Issue Relationships is not as clear, however.)

Energy Issue Salience

At an aggregate level, the salience of the energy problem remained about constant in the community over the three years of the study, although individuals may have changed their perceptions from time to time.[16]

In regard to the relationship of energy issue salience to other variables, it has been proposed that:

> H5: There will be a positive relationship between Energy Issue Salience and Energy Issue Relationships.

There is no relationship between Energy Issue Salience and Energy Issue Relationships in any of the comparisons in Table 3. Thus, there is no support for H5.

It has also been proposed that:

> H6: There will be a positive relationship between public affairs and energy media use and Energy Issue Salience.

As Table 6 indicates, attention to television public affairs content is associated with increased salience ascribed the energy issue 1981-1982, and with maintenance of higher salience in 1983. Attention to television energy stories is associated with higher energy issue salience in all three years,

although it is not clear that it led to salience gain 1981-82. Attention to newspaper energy stories, however, led to gain in Energy Issue Salience from 1981 to 1982, and again from 1982 to 1983. Reading of utility energy bill-insert pamphlets is also related to higher salience in one year.

A reversal of expectations occurs, however, in regard to reading public affairs magazines. Reading these publications appears to be related to loss in the perceived salience of the energy issue from 1981 to 1982. Thus, H6 as phrased is supported only in relation to some media, most notably television and newspapers. Content analysis may be necessary to determine differences in play of energy stories across these different media.

It is noteworthy that Energy Issue Salience bears few if any relationships with either measure of energy knowledge. However, across all three years of the study, energy conservation attitudes relate positively to Energy Issue Salience. (These relationships hold with attitudes dependent.)

The relationship of education with energy issue salience disappears in this analysis. However, it also appears that the energy issue is not more salient to those who are older, live in older homes, have lower income, or have larger families. These relationships were expected if economic, health, and quality of life concerns were adding salience to the energy issue among those segments of the population.

It should be noted that only a relatively small part of the variance in the various dependent variables has been accounted for by the main variables of interest in this study. Some of what is lacking in strength, however, may be made up in the consistency or repetitiveness of some of the patterns that have been found over time.

DISCUSSION

Consistent with the Knowledge Gap model, the more educated members of this community are somewhat more likely to spend time reading newspapers and paying attention to newspaper public affairs content. They are also more likely to read public affairs magazines and watch television public affairs programs. Thus, the media use habits of the more educated, exposing them to more public affairs content, extends beyond newspapers.

Energy media, which include energy-related newspaper stories and television content, are however used more evenly across higher and less educated segments of the community. Most noteworthy is that reading of newspaper energy stories is associated with higher levels of knowledge about the energy issue among the higher educated, while viewing of televised energy commercials is associated with higher levels of this knowledge among the less educated. These are rather hopeful signs from the standpoint of public information campaigns about energy that attempt to reach the less educated segments of the community. More research is needed, however, to determine the manner in which the energy commercials related information about the national energy issue.

The more highly educated members of the community gained knowledge about the energy issue at a faster rate than the less educated, producing a knowledge gap, from 1981 to 1982. Over the course of the next year (1982 to 1983), the more highly educated still retained a knowledge "edge." The gap may have closed, although slightly.

The most likely explanation that would account for this pattern suggests that local mass media were still giving considerable attention to the energy issue, augmented by coverage related to the infrared analysis of homes in the community and the severity of the winter, into 1982. The increased infusion of this information may have produced the 1981-1982 knowledge differential.

From 1982 to 1983, it is likely that the media in general cut back on coverage of the energy issue. If media coverage decreased, it is likely that the knowledge gap would at least cease to widen.

It is also possible that media information campaigns involving energy, especially those using televised commercials, kept the less educated at least apace of the more educated in knowledge levels from 1982 to 1983. If a slight closing of the knowledge gap occurred, it may be attributable to such campaigns, since knowledge gain among the less educated from 1982 to 1983 is associated with viewing, in particular, energy commercials during that time. There are no comparable relationships between media use and knowledge gain among the less educated from 1981 to 1982, when the gap was widening.

It also appears that some conflict was developing in this community over the efficacy and desirability of energy conservation measures in 1980. The conflict may have diminished knowledge differences prior to the first wave of interviews in 1981. Overall, given these patterns from 1981 through 1983, it is likely that there had been a series of knowledge gaps widening and closing since the 1973 Arab Oil Embargo.

Although motivations to gain knowledge were measured only indirectly, there is no evidence that they were related to knowledge gain. Further studies, however, should examine the factors that, among the less educated, led to use of the media that related to higher knowledge levels and knowledge gain.

Although national data indicate that the perceived importance of the energy issue fell off markedly in the early 1980s, the salience of the energy issue in this community, at the aggregate level, seems to have remained about constant and relatively high from 1981 to 1983. Those who read newspaper energy stories, or view television public affairs or energy content, are more likely to perceive higher salience in the energy issue. Reading of national

news magazines, however, is associated with perceiving the energy issue as less salient from 1981 to 1982. It is possible that national coverage of energy fell off during that time, while local coverage remained relatively high. From 1982 to 1983, the relationships of viewing television public affairs and energy content with energy issue salience diminish. This pattern would be consistent with the proposition that local media coverage of energy diminished from 1982 to 1983. By 1983, only the reading of newspaper energy stories bears a noteworthy association with the importance members of this community ascribe to the energy situation. As noted, reading these stories is also associated with gain of knowledge about the energy issue among the more highly educated from 1982 to 1983. These patterns, especially in regard to salience, may be attributed to the existence of a specialized energy reporting beat on the local metropolitan daily newspapers.

Salience relates much more consistently to energy conservation attitudes than to energy knowledge in this community. In addition, conservation attitudes are not consistently related to knowledge about the energy situation.

Further research should include content analyses of local and national coverage of energy during this time, to validate the coverage patterns suggested in this analysis.

CONCLUSION

Information campaigns about energy and other complex issues need to take into account different patterns of media use and knowledge gain related to social status, in particular education. Energy communication media seem to be used by the more and less educated about equally, although among these media knowledge about energy is most consistently related to reading of newspaper energy stories by the more educated, and to viewing televised energy commer-

cials among the less educated. Reading of newspaper energy stories and viewing of television public affairs and energy content is positively related to the perceived salience of the energy issue. It is likely that the maintenance of a specialized energy reporting beat on the metropolitan dailies contributed to the perceived salience of the energy problem in this community over time, and to energy knowledge gain over time among the more educated in particular.

NOTES

1. Genova and Greenberg (1979) also note it is important to determine the origins of informational interests. Some interests may be related to social structural differences. Lovrich and Pierce (1984), however, found that motivation and social status were not surrogates for each other. Situation-specific factors in their study were more strongly related to knowledge levels than social status.

2. One of the attempts to influence public energy conservation on a large scale using the mass media was President Carter's three television appearances in 1977, in which he termed the energy problem the "moral equivalent of war." The programs had at best a temporary effect on various public cognitions (Owens and Capel, 1979; Allen and Weber, 1983), and perhaps a transient influence on energy conservation attitudes (Richman, 1979), but apparently no impact on behavior (Luyben, 1982). Analyses of the relationship of communication and information to consumer energy conservation behavior can be found in sources such as Stern and Gardner (1980, 1981), Stern and Aronson (1984) and Winnett et al. (1984).

3. Griffin (1977) found that, even though age might be negatively related to energy issue knowledge, significant differences did not emerge when the sample was divided into those 65 and over as compared to those under 65.

4. Other analyses of this survey involve energy conservation behavior.

5. The author is grateful to Jack M. McLeod, University of Wisconsin-Madison, and Carroll J. Glynn, now of Cornell University but then a graduate student at UW-Madison, for their collaboration in the development of the questionnaire and for conducting a simultaneous, cross-community version of this study in Madison in 1981. The results of the West Allis and Madison analysis can be found in McLeod et al. (1983) and McLeod et al. (1987).

6. An earlier version of this analysis, using only 1981 and 1982 data from West Allis, was presented to the Mass Communication Division of the International Communication Association at their 1985 annual convention in Hawaii.

7. Some funding for the 1983 wave of interviews was provided by a grant from

the Wisconsin Electric Power Company.

8. An item included in the questionnaire in all three years, regarding the impact of unavailability of crude oil, and used in some past analyses of these data, was removed due to poor intercorrelation with overall test score in all three years.

9. The question was: "We'd like to know how you feel about some specific issues. For each of the following, could you tell us whether you think it is very important, somewhat important, or not at all important to you." Energy was rated amidst a set of other current issues. (In 1981, a four-point scale was used, with responses of very important, important, somewhat important, and not at all important.) Higher numeric values were coded to represent higher saliences.

10. Items that comprised the conservation attitude index are indicated below (see McLeod et al., 1983):

> To me, it's worth the extra expense to keep the thermostat above 65 degrees. (Reverse scored.)
>
> It is everyone's responsibility to conserve energy: the little things add up.
>
> People who can afford it should be able to buy as much energy as they want. (Reverse scored.)
>
> In my daily life, there is more to be gained than lost by cutting down on the use of energy.
>
> I know science will find an answer before energy problems get too bad. (Reverse scored.)

Based on further testing of the attitude items, the first item was replaced after 1981 by the following (see Becker et al., 1981):

> I am willing to wear heavier clothes indoors in the winter so that I can set my thermostat lower than I otherwise would.

11. The "stop and think" measure was used in an attempt to tap information rehearsal, reiteration and elaboration processes which can strengthen the long-term memory trace for the information (Craik and Lockhart, 1972).

12. Media use and exposure patterns in 1982 were probably affected by the local major league baseball team being involved in the World Series that year. The 1982 survey took place not long after. Exposure and media use measures were very likely affected by recall of recent use. The less educated may have spent proportionately more time watching television and reading newspapers during and after the World Series, which would account for at least some of the 1982 patterns.

13. A measure of knowledge of how to save energy in the home, termed "Practical Energy Knowledge," was introduced in 1982. The partial correlation of this measure with education is .12 ($p<.01$) in 1982, and .16 ($p<.001$) in 1983.

14. If gaps closed at all 1982-83, ceiling effects must be considered. Ettema and Kline (1977) note three types of ceiling phenomena: artificial, true, and imposed ceilings. It is not likely that there was an occurrance of an artificial ceiling (the measuring instrument at Time 2 being more sensitive to knowledge gain by those who scored lower at Time 1), since the autocorrelations of both dependent measures are positive and those of the Public Affairs Knowledge Test are higher in 1982-83 than in 1981-82. A true ceiling is not likely, since the more highly educated still were not attaining close to "perfect" scores on the closed-ended test by 1983, and because scores on the open-ended Energy Issue Relationships test would suggest that more could be generated even among the more highly educated. Imposed ceilings in this study could occur if the more educated believe they have enough information, while the less educated do not, providing a differential in motivation. While the measurement is not direct, an analysis of the perceived need for information about energy use in the home indicates that this need became more positively associated with education in 1983 as compared to the previous years. Thus, this explanation is not likely. An imposed ceiling could also occur if naturally occurring media messages do not contain all the information in the domain being tested. While a content analysis would be needed to address this possibility, it is not a probable explanation. Construction of the closed-ended test was based on information in the various media, although the information may not necessarily have been repeated in 1982-83. The open-ended Energy Issue Relationships measure is not content-specific in this analysis, and should not be affected at the levels of recall generated in the study.

15. A content analysis is required to determine whether the weekly newspapers in this community may have contained some misinformation about the energy situation.

16. Although the salience measure changed after 1981, the results can be made comparable by collapsing the two highest scale values in the 1981 measure. Under these circumstances, 47% of the 1981 respondents gave energy the highest scale value of salience, 48% of the 1982 respondents, and 50% of the 1983 respondents. (Margin of error at 95% confidence level is 5%.)

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Table 1
Partial Correlation of Education
With Control, Independent, and Dependent Variables

Variable	1981	1982	1983
Sensitization		-.06	-.02
Income	.22c	.23c	.19c
Family Size	-.02	.03	-.01
Age	-.13b	-.11b	-.18c
Age of House	-.14b	-.09a	-.10a
Media Exposure:			
Newspapers	.13b	.01	.09a
Television	-.03	-.10a	-.06
Weeklies	.07	.03	.09a
Public Affairs Media Use:			
Newspapers	.21c	.07	.13b
Television	.14b	.02	.10a
Magazines	.17c	.22c	.14c
Discussions	-.05	-.01	.00
Energy Media Use:			
Newspapers	.01	.06	.07
Television	.06	-.03	.01
Commercials	.07	-.01	.09a
Pamphlets	.06	-.01	.03
Discussions	.15b	-.02	-.05
Energy Issue Salience	.10a	-.03	.01
Energy Conservation Attitudes	.09a	.09a	.10a
Energy Knowledge:			
Public Affairs	.07	.18c	.15c
Issue Relationships		.23c	.20c

Significance Key: a .05
b .01
c .001

Note: Relationships with independent and dependent variables are controlled by demographic control variables, and by sensitization in 1982 and 1983. Relationships with control variables controlled by remaining control variables (including sensitization).

Table 2
Relationship of Education, Other Control Variables, Salience, Attitudes, and Communication with Public Affairs Energy Knowledge 1981-1983

Multiple Regression (Partial Betas)

Variable	1981	1982	1983	1981-1982	1982-1983
Sensitization		.06	.01		
Autocorrelation				.29c	.40c
Education	.02	.17c	.09a	.29c	.06
Income	.02	.15b	.08	.11	.08
Size of Family	.00	-.05	.06	-.16a	.03
Age	-.22b	-.11a	-.16b	-.21b	-.11
Age of House	.06	-.07	-.07	.03	.01
Energy Salience	.01	.02	-.04	.21b	-.11
Energy Attitudes	-.09	-.01	-.01	-.04	-.03
Media Exposure:					
Newspapers	.04	.01	.13a	-.08	.12a
Television	-.11	-.01	-.05	.00	-.07
Weeklies	-.08	-.02	-.11a	-.02	-.08
Public Affairs Media Use:					
Newspapers	.11	-.05	.02	.08	-.05
Television	.09	.05	.01	.06	.04
Magazines	-.02	.07	-.02	.04	-.01
Discussions	-.05	.05	-.07	.01	-.04
Energy Media Use:					
Newspapers	-.05	.17b	.16b	.08	.06
Television	.09	-.01	-.10	.05	-.03
Commercials	.11a	-.01	.19c	-.01	.15c
Pamphlets	.06	-.02	-.01	-.04	-.01
Discussions	-.01	.08	-.06	.09	-.10
Multiple r	.31	.39c	.41c	.58c	.56c
N	298	386	397	211	291

Significance key: a .05
b .01
c .001

Table 3
Relationship of Education, Other Control Variables, Salience, Attitudes, and Communication With Energy Issue Relationships 1982-1983

Multiple Regression (Partial Betas)

Variable	1982	1983	1982-1983
Sensitization	-.01	.05	
Autocorrelation			.11a
Education	.22c	.17c	.13a
Income	-.04	-.02	-.01
Size of Family	-.02	.10	.08
Age	.04	-.12a	-.14a
Age of House	.01	-.12a	-.12a
Energy Salience	.04	.03	.04
Energy Attitudes	.05	.11a	.09
Media Exposure:			
Newspapers	.03	.07	.10
Television	-.03	.07	.07
Weeklies	.01	.00	-.01
Public Affairs Media Use:			
Newspapers	-.05	.10	.12a
Television	-.10	-.01	.02
Magazines	.05	-.04	-.07
Discussions	-.02	.00	-.01
Energy Media Use:			
Newspapers	.05	.07	.00
Television	.03	.07	.13a
Commercials	.14b	.08	.09
Pamphlets	.05	.03	.04
Discussions	-.01	-.01	.02
Multiple r	.30a	.42c	.42c
N	385	389	285

Significance key: a .05
b .01
c .001

Table 4
Relationship of Control Variables,
Salience, Attitudes, and Communication
with Public Affairs Energy Knowledge 1981-1983
by Education Level

Multiple Regression
(Partial Betas)

	Low Education					High Education				
Variable	1981	1982	1983	1981-1982	1982-1983	1981	1982	1983	1981-1982	1982-1983
Sensitization		-.03	-.04				.19a	.05		
Autocorrelation				.34c	.38c				.15	.40c
Income	.02	.17a	.13a	.11	.12	-.01	.14	.03	.15	.07
Family Size	-.04	-.04	.14	-.13	.11	.04	-.13	-.11	-.37b	-.09
Age	-.22b	-.20b	-.11	-.36c	-.05	-.20	-.01	-.36c	-.24	-.30
Age of House	.03	-.17b	-.12	-.06	.03	.09	.13	-.01	.33b	-.02
Salience	.05	.01	-.09	.11	-.10	.05	.05	.05	.34b	.12
Attitudes	-.07	.04	.05	.06	.07	-.15	-.12	-.05	-.26a	-.11
Exposure:										
Newspapers	-.02	.05	.16a	.02	.18a	.07	-.13	.11	-.26	.08
Television	-.19a	.04	-.04	.03	-.03	.02	-.13	-.01	-.10	-.12
Weeklies	-.03	.06	-.11	-.01	-.05	-.11	-.18a	-.13	-.21	-.11
Public Affairs Media Use:										
Newspapers	.16a	-.07	.02	.04	-.11	.09	.02	.11	.22	.09
Television	.15a	.05	-.01	.11	.01	-.11	.03	-.01	.11	.08
Magazines	-.06	.06	.01	.01	.06	.14	.10	-.03	.01	-.07
Discussions	-.11	.04	-.03	-.03	-.11	.04	.01	-.07	-.02	-.10
Energy Media Use:										
Newspapers	-.07	.16a	.05	.09	.01	-.07	.19a	.35b	-.06	.21a
Television	.06	-.02	-.05	-.10	.04	.25	.04	-.23a	-.12	-.19
Commercials	.07	-.04	.29c	-.08	.25c	.14	.08	.08	.21a	.03
Pamphlets	.04	-.12	-.06	-.15	-.06	.10	.12	.04	.21	.01
Discussions	.07	.07	-.03	.17a	-.11	-.13	.08	-.15	.07	-.16
Multiple r	.35	.41b	.47c	.60c	.59c	.38	.47a	.46a	.64a	.61c
N	197	243	250	137	181	101	143	147	74	110

Significance key: a .05
b .01
c .001

Table 5
Relationship of Control Variables,
Salience, Attitudes, and Communication
with Energy Issue Relationships 1982-1983
by Education Level

Multiple Regression
(Partial Betas)

	Low Education			High Education		
Variable	1982	1983	1982-1983	1982	1983	1982-1983
Sensitization	-.11	.02		.08	.04	
Autocorrelation			.07			.22a
Income	-.07	-.03	-.03	.02	.02	.11
Size of Family	-.05	.07	.03	.05	.17	.19
Age	-.01	-.16a	-.21a	.09	-.13	-.08
Age of House	-.12	-.11	-.05	.14	-.19a	-.18
Salience	.06	.00	-.03	-.05	.07	.14
Attitudes	.05	.16a	.12	.12	.06	.08
Media Exposure:						
Newspapers	-.07	.02	.05	.12	.12	.13
Television	.03	.09	.10	-.14	.08	.09
Weeklies	.05	-.01	-.01	-.04	.06	.04
Public Affairs Media Use:						
Newspapers	-.07	.16a	.20a	.03	.10	.08
Television	-.02	-.05	-.04	-.15	.09	.14
Magazines	.16a	.01	.00	-.11	-.10	-.12
Discussions	-.09	.05	-.03	.08	-.16	-.16
Energy Media Use:						
Newspapers	.15a	.04	-.08	-.07	.27b	.23a
Television	-.05	.04	.13	.06	.03	.01
Commercials	.16b	.11a	.16a	.14	.04	.02
Pamphlets	-.05	.05	.09	.17a	-.11	-.14
Discussion	-.01	-.03	-.03	-.04	.06	.12
Multiple r	.34	.38b	.40	.37	.48a	.54a
N	242	246	178	143	143	107

Significance Key: a .05
b .01
c .001

Table 6
Relationship of Education, Other Control Variables, Knowledge, Attitudes, and Communication With Energy Issue Salience 1981-1983

Multiple Regression (Partial Betas)

Variable	1981	1982	1983	1981-1982	1982-1983
Sensitization		.05	.03		
Autocorrelation				.03	.19b
Education	.03	-.06	-.02	-.10	-.01
Income	.11	-.04	-.06	-.05	.00
Size of Family	.04	-.08	.10	.04	.10
Age	.02	-.05	.04	.09	.04
Age of House	-.04	-.02	.04	-.04	.07
Public Affairs Energy Knowledge	.01	.02	-.04	.17a	-.01
Energy Attitudes	.18b	.16c	.12a	.18b	.11a
Media Exposure:					
Newspapers	.06	-.02	-.02	-.04	-.05
Television	.11a	-.12a	-.03	-.13	.06
Weeklies	-.01	-.01	.01	-.03	.02
Public Affairs Media Use:					
Newspapers	.08	.06	-.06	.04	-.05
Television	.02	.17c	.13a	.20b	.10
Magazines	.01	-.11a	.06	-.16a	.10
Discussions	.01	.03	.03	-.01	-.05
Energy Media Use:					
Newspapers	.09	.12a	.21c	.20a	.13a
Television	.17a	.17b	.11a	.13a	.10
Commercials	-.09	-.01	-.02	-.11	.00
Pamphlets	.14b	-.02	.00	.07	.05
Discussions	.06	.07	.00	.00	-.05
Multiple r	.51c	.44c	.38c	.53c	.41c
N	294	386	397	210	290

Significance Key: a .05
b .01
c .001